

John M. Guynn

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**From:** Randy Smith [rsmith@earthshell.com]  
**Sent:** Saturday, September 17, 2005 6:09 PM  
**To:** John M. Guynn  
**Subject:** FW: UPDATE: Wrap Model 005  
**Attachments:** Wrap Model - Rev 005 040501.xls

John:

Please let me know if you need any more information. There is a lot more.

RAS

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**From:** Matt Loos  
**Sent:** Friday, April 06, 2001 10:05 AM  
**To:** Donna Balinkie; John Nevling; Randy Smith; Kishan Khemani  
**Cc:** Matt Loos; Scott Houston  
**Subject:** UPDATE: Wrap Model 005

Folks,

Yesterday afternoon, Simon requested that I insert an additional tab to reflect the economics of substituting PLA for Biomax, using the Wrap L Biomax/Ecoflex formulation.

I would appreciate your review and comments.

Thank you,  
Matt

9/19/2005

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## Biodegradable Wrap Model

### Version changes listed by date (most recent at top)

**Color Key**

Assumptions link/Input  
Linked to another tab  
Calculated  
Drives a link to a tab

Light Yellow  
Turquoise  
Lavender  
Light Green

(Color Scheme just under Turquoise)  
(Color Scheme just to the left of Lavender)

**Version 005 04-05-01 - Matt Loos**

- 1- Added additional tab to reflect replacing Ecomax with Eastar
- 2- Updated General Assumptions for Eastar and new tab
- 3- Input notes regarding freight and duty assumptions on Ecoflex
- 4- Updated Exchange rates
- 5- Added additional tab to reflect replacing Biomax with PLA
- 6- Updated General Assumption for PLA and new tab

7-  
8-  
9-  
10-  
11-  
12-

- Version 004 03-09-01 - Matt Loos**
- Version 003 02-20-01 - Matt Loos**
- Version 002 11-27-00 - Matt Loos**
- Version 001 11-13-00 - Matt Loos**



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## Biodegradable Wrap Model

### Issues

- 1- What about vendor efficiencies? What are the Throughput assumptions.
- 2- Seek vendors that allow Blowing, Slitting, Printing & Winding as one process.
- 3- At this point, none of these steps are optimized
- 4-
- 5-
- 6-
- 7-
- 8-
- 9-
- 10-
- 11-
- 12-
- 13-

#### Distribution - Internal Review - 02/28/01 - integral to wrap team

- A) Business Plan - Simon
  - Bagkraft / Bourroughs
  - Apply technology / single laminate material
- B) Blowing, Printing, Sheeting, Slitting to \$0.30 per pound - Randy
  - requires formula to be 'locked-in'
  - Transamerican blowing capacity is 4500MT/year, OR 1/3 of printing capacity
- C) Discussion with Dupont and BASF for 'cocktail' - Simon (Donna)
  - Compounding in-line at the source

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## Biodegradable Wrap Model

### Comparison Summary with Commercial Volume Pricing

PRODUCT	MATERIAL	BASIS WT (gm/sqM)	WRAP WT (gm)	WRAP SIZE	Avg \$/sqM	\$/LB	Avg \$/1000
<b>Current</b>							
Famous/Big 4-Way	20#/24# Plastawrap	39.5	4.6	14 1/4"x13"	2.62	1.22	12.31
Western/Super 4-Way	20#/24# Plastawrap	39.5	5.6	15"x15"	2.57	1.20	14.70
Special/Burger Promo	20#/24# Plastawrap	39.5	5.6	15"x15"	2.62	1.20	14.99
Crispy Chickn Paper 4-Way	20#/24# Plastawrap	39.5	5.6	15"x15"	2.62	1.14	14.97
Chicken 4 Way Paper	20#/24# Plastawrap	39.5	4.5	13 1/2"x13"	2.86	1.18	11.82
Hamb/Chsbrgr/Fish/Promo	15#/18# Plastawrap			12 1/2"x13"			7.63
Sunrise/Burrito Foil	.00025/14# Paper (Foil)			10 1/2"x 11"			11.92
Typical High Quality Burger Wrap w/ Graphic	20#/24# Plastawrap	39.5	5.6	15" x 15"	2.62	1.20	14.99
<b>Proposed</b>							
Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron	See Wrap A tab		6.1	15" x 15"	3.18	1.35	18.18
Sandwich Wrap L - Biomax/Eastar - 50 micron	See Wrap L-Biomax/Eastar tab		5.1	15" x 15"	2.94	1.50	16.79
Sandwich Wrap L - PLA/Ecoflex - 50 micron	See Wrap L-PLA/Ecoflex tab		5.1	15" x 15"	2.54	1.29	14.50
Sandwich Wrap L - Biomax/Ecoflex - 50 micron	See Wrap L-Biomax/Ecoflex tab		5.1	15" x 15"	2.54	1.29	14.50

**Notes:**  
Quick White (Collar)

16#/FC807

12"x12"

4.17

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Biodegradable Wrap Model

Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
I. MODEL DESCRIPTION					
	Review 4 different Wrap formulations				
	2 formulations (A, L-BiomaxEcoflex) based upon Ecoflex/Biomax				
	1 formulation (L-BiomaxEaslar) based upon Easlar MW/Biomax				
	1 formulation (L-PLAEcoflex) based upon Ecoflex/PLA				

II. PRODUCT CONFIGURATION

Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron	15' x 15'	Ecomax 20/80, 3% SiO2, 5% TiO2, 25% CaCO2 filled, white, printed 4 colors, 30 micron
Sandwich Wrap L - Biomax/Ecoflex - 50 micron	15' x 15'	50% Biomax - 4026, 15% Ecoflex / 35% Filler - ES4336
Sandwich Wrap L - Biomax/Easlar - 50 micron	15' x 15'	50% Biomax - 4026, 15% Easlar MW / 35% Filler - ES4336
Sandwich Wrap L - PLA/Ecoflex - 50 micron	15' x 15'	50% PLA, 15% Ecoflex / 35% Filler - ES4336

III. PRODUCT FORMULATION (Weight mix ratios)

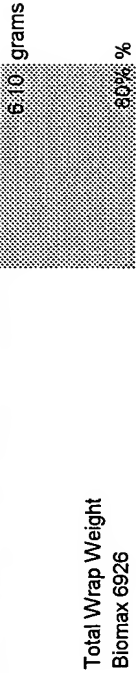
All formulations (weight mix ratios) are controlled on the respective Wrap presentation tabs

Wrap thickness (microns) is related to weight, but model drives from weight (grams) only.

Bioplast GF 105/30/M20

Ecoflex FBX	66.01%	% of Total Bioplast GF 105/30/M20
PLA - Germany	28.29%	% of Total Bioplast GF 105/30/M20
Slipping Agent	0.94%	% of Total Bioplast GF 105/30/M20
Loxamid	33.33%	% of Total Slipping Agent
Loxiol	33.33%	% of Total Slipping Agent
K21	33.33%	% of Total Slipping Agent
Masterbatch white	4.76%	% of Total Bioplast GF 105/30/M20

Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron



5.4grams theoretical weight - Randy @ 02/23/01

5.1g current weight - Randy @ 02/23/01

5.83 without ink weight - Randy @ 02/23/01

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Biodegradable Wrap Model

Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Ecoflex FBX	20%	%	% of Biomax + Ecoflex		
Talc - SiO2	3.0%	%	% of Total Wrap Weight		
Whitener - TiO2	5.0%	%	% of Total Wrap Weight		
Limestone - CaCO2	25.0%	%	% of Total Wrap Weight		
Sandwich Wrap L - Biomax/Ecoflex - 50 micron					
Total Wrap Weight	5.10	grams			
Raw Materials:					
Biomax 6926	50%	%	% of Total Wrap Weight		
Ecoflex FBX	15%	%	% of Total Wrap Weight		
Filler - Assume CaCO2	35%	%	% of Total Wrap Weight		
Formulation:					
Biomax 6926	50%	%	% of Total Wrap Weight		
PaperMatch ES4338	50%	%	% of Total Wrap Weight		
Sandwich Wrap L - Biomax/Eastar - 50 micron					
Total Wrap Weight	5.10	grams			
Raw Materials:					
Biomax 6926	50%	%	% of Total Wrap Weight		
Eastar MW - H	15%	%	% of Total Wrap Weight		
Filler - Assume CaCO2	35%	%	% of Total Wrap Weight		
Formulation:					
Biomax 6926	50%	%	% of Total Wrap Weight		
PaperMatch ES4338	50%	%	% of Total Wrap Weight		
Sandwich Wrap L - PLA/Ecoflex - 50 micron					
Total Wrap Weight	5.10	grams			
Raw Materials:					
PLA - Hycail B.V.	50%	%	% of Total Wrap Weight		
Ecoflex FBX	15%	%	% of Total Wrap Weight		
Filler - Assume CaCO2	35%	%	% of Total Wrap Weight		
Formulation:					
PLA - Hycail B.V.	50%	%	% of Total Wrap Weight		
PaperMatch ES4338	50%	%	% of Total Wrap Weight		
IV. RAW MATERIALS PRICING (FOB vendor)					
Low Volume					
Inorganics					
Anti-block - SiO2	\$ 0.14	\$/lb.		95%	
Whitener - TiO2	\$ 0.99	\$/lb.		95%	
Inorganic Filler - CaCO3	\$ 0.09	\$/lb.		95%	
Resin					
all prices are FOB Converter					Product design still not finalized.

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## Biodegradable Wrap Model

### Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Biomax 4026 - DuPont (Rigid)	\$ 1.18	\$/lb.	\$1.18 initial verbal quote provided by DuPont	50%	
Ecoflex FBX - BASF (Flexible)	\$ 5.80	DM/kg	Provided by H.Schmidt - 02/22/01		
Ecoflex FBX - BASF (Flexible)	\$ 1.20	\$/lb.	Assumes 'delivered price'		
Eastar MW - H	\$ 2.00	\$/lb.	High Grade - Provided by Kishan. Assumes 'delivered price'	90%	
Eastar MW - L	\$ 1.83	\$/lb.	Low Grade - Provided by Kishan. Assumes 'delivered price'	90%	
PLA - Hycail B.V. (Rigid)	\$ 1.00	\$/lb.	Provided by Kishan - verbal quote from Bill Kelly. Hycail U.S. prices not yet available		
Masterbatch Compounding by A. Schulman ES4228	\$ 0.75	\$/lb.	Proprietary - A.Schulman Inc.		Randy
% Filler - Assume CaCO3	70%		% of respective Masterbatch		
Masterbatch Compounding by Biotec					
Bioplast GF 105/30/W20	\$ 7.50	DM/kg	Biotec Sales price = 6.22DM Raw Mat. + 1.28DM Compounding	95%	
Bioplast GF 105/30/W20	\$ 1.55	\$/lb.			
PLA - Germany	6.63	DM/kg	Provided by H.Schmidt - 02/22/01		
PLA - Germany	\$ 1.37	\$/lb.			
Loxamid (Slipping Agent)	11.80	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxamid (Slipping Agent)	\$ 2.45	\$/lb.			
Loxol (Slipping Agent)	5.35	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxol (Slipping Agent)	\$ 1.11	\$/lb.			
K21 (Slipping Agent)	11.48	DM/kg	Provided by H.Schmidt - 02/22/01		
K21 (Slipping Agent)	\$ 2.38	\$/lb.			
Masterbatch white	9.00	DM/kg	Provided by H.Schmidt - 02/22/01		
Masterbatch white	\$ 1.97	\$/lb.			

BASF Proprietary composition; Consists mostly of TiO2 (60%??) and Ecoflex (40%??), but there is most likely other trace additives.

	Derived Total raw material cost excluding compounding cost
Bioplast GF 105/30/W20	\$ 1.290 \$/lb.
Ecoflex FBX	\$ 0.794 \$/lb.
PLA	\$ 0.395 \$/lb.
Slipping Agent	\$ 0.019 \$/lb.
Loxamid	\$ 0.065 \$/lb.
Loxol	\$ 0.003 \$/lb.
K21	\$ 0.037 \$/lb.
Masterbatch white	\$ 0.089 \$/lb.



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## Biodegradable Wrap Model

### Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Masterbatch Compounding by Techmer PM					
Ecoflex / 55% CaCO3	\$ 1.85	1,000 lbs \$/lb.	Kishan Memo - 11/06/00	95%	Masterbatch compounding costs will remain relatively high without competition
% CaCO3	55.0%		% of respective Masterbatch		
Ecoflex / 64% TiO2/BaSO4	\$ 2.05	\$/lb.	Kishan Memo - 11/06/00	95%	
% TiO2/BaSO4	64.0%		% of respective Masterbatch		
Ecoflex / (Assume) 60% SiO2	\$ 1.90	\$/lb.	Kishan Memo - 11/06/00	95%	
% TiO2	60.0%		% of respective Masterbatch		
Biomax / 61% CaCO3	\$ 1.90	\$/lb.	Kishan Memo - 11/06/00	95%	
% CaCO3	61.0%		% of respective Masterbatch		
Biomax / 53% TiO2/BaSO4	\$ 2.10	\$/lb.	Kishan Memo - 11/06/00	95%	Converter is not yet identified Dupont will not convert.
% TiO2/BaSO4	53.0%		% of respective Masterbatch		
Biomax / 50% SiO2	\$ 2.02	\$/lb.	Kishan Memo - 11/06/00	95%	
% SiO2	50.0%		% of respective Masterbatch		This process step not optimized
In-line Process					
Combined in-line	\$ -	\$/lb.	Blow, Slit, (Embosse), Print & Sheet		This process step not optimized
Blowing			Integral to in-line process		
Gemini Plastics	\$ 0.36	\$/lb.			This process step not optimized
Transamerican Plastics	\$ 0.52	\$/lb.			
Polymer Packaging	\$ 0.35	\$/lb.			This process step not optimized
Slitting			Integral to in-line process		
Gemini Plastics					This process step not optimized
Machine/Labor rate	\$ 35.00	\$/hour			
Machine speed	150.0	ft/min	Represents speed of slowest process in-line		This process step not optimized
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		This process step not optimized
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min			This process step not optimized
Parts per minute on given machine	360.0	parts/min			
Cost per part	\$ 0.00167	\$/part			This process step not optimized
Transamerican Plastics					
Machine/Labor rate	\$ 65.00	\$/hour			This process step not optimized
Machine speed	150.0	ft/min			
Machine width	45.0	in			This process step not optimized
Part width	15.0	in			
Parts wide	3.0	parts			This process step not optimized
Parts per minute (single width)	120.0	parts/min			
Parts per minute on given machine	360.0	parts/min			This process step not optimized
Cost per part	\$ 0.00333	\$/part			
Printing			Integral to in-line process		This process step not optimized

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## Biodegradable Wrap Model

### Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Associated Polybag					
Machine/Labor rate	\$ 120.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min	Assume part no greater than 15" x 15"		
Parts per minute on given machine	360.0	parts/min			
Cost per part	\$ 0.00556	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 125.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min	Assume part no greater than 15" x 15"		
Parts per minute on given machine	360.0	parts/min			
Cost per part	\$ 0.00579	\$/part			
Embossing					
Gemini Plastics					
Machine/Labor rate	\$ 45.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min	Assume part no greater than 15" x 15"		
Parts per minute on given machine	360.0	parts/min			
Cost per part	\$ 0.00268	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min	Assume part no greater than 15" x 15"		
Parts per minute on given machine	360.0	parts/min			
Cost per part	\$ 0.00174	\$/part			
Sheeting					
Associated					
Machine/Labor rate	\$ 35.00	\$/hour			
Machine speed	83.3	ft/min			
Machine width	45.0	in			

This process step not optimized

Integral to in-line process

This process step not optimized

Not part of in-line process

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## Biodegradable Wrap Model Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Part width	15.0	in	Assume part no greater than 15" x 15"		Specific Sheeter equipment exists, so that the Bagger would not need to be modified
Parts wide	3.0	parts			
Parts per minute (single width)	66.6	parts/min			
Parts per minute on given machine	199.9	parts/min	100 ppm per lane; 2 lanes		
Cost per part	\$ 0.00292	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	50.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts	Sheeting's limiting factor is 'catching' the sheeted wraps as they come off of the machine, i.e. manual limitation		
Parts per minute (single width)	40.0	parts/min			
Parts per minute on given machine	120.0	parts/min			
Cost per part	\$ 0.00514	\$/part			
all prices are FOB Converter					Product design still not finalized.
Inorganics					
Anti-block - SiO2	\$ 0.14	\$/lb.	Randy verified price	95%	
Whitener - TiO2	\$ 0.99	\$/lb.	Randy verified price	95%	
Inorganic Filler - CaCO3	\$ 0.09	\$/lb.	Randy verified price	95%	
Resin					
Biomax 4026 - DuPont (Rigid)	\$ 1.00	\$/lb.	\$1.00 provided by Simon based upon perceived economies with volume	10%	
Ecoflex FBX - BASF (Flexible)	4.80	DM/kg	Provided by H.Schmidt based upon general talks with BASF; up to 30,000MT		
Ecoflex FBX - BASF (Flexible)	\$ 1.00	\$/lb.	Assumes 'delivered price'		
Eastar MW - H	\$ 2.00	\$/lb.	High Grade - Provided by Kishan. Assumes 'delivered price'	90%	
Eastar MW - L	\$ 1.83	\$/lb.	Low Grade - Provided by Kishan. Assumes 'delivered price'	90%	
PLA - Hycail B.V. (Rigid)	\$ 1.00	\$/lb.	Provided by Kishan - verbal quote from Bill Kelly. Hycail U.S. prices not yet available		
Masterbatch Compounding by A. Schulman					
ES4228	\$ 0.75	\$/lb.	Proprietary - A.Schulman Inc.		Randy
% Filler - Assume CaCO3	70%		% of respective Masterbatch		

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## Biodegradable Wrap Model Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Masterbatch Compounding by Biotec					
Bioplast GF 105/30 (Wrap)	7.50	DM/kg	Biotec Sales price = 6.50DM Raw Mat. + 1.5DM Compounding	95%	
Bioplast GF 105/30 (Wrap)	1.55	\$/lb.			
PLA - Germany					
PLA - Germany	6.53	DM/kg	Provided by H. Schmidt - 02/22/01		Can Biotec compound this, or always 3rd party sourced?
Loxamid (Slipping Agent)	1.37	\$/lb.	Provided by H. Schmidt - 02/22/01		
Loxamid (Slipping Agent)	11.80	DM/kg	Provided by H. Schmidt - 02/22/01		
Loxol (Slipping Agent)	2.45	\$/lb.	Provided by H. Schmidt - 02/22/01		
Loxol (Slipping Agent)	5.35	DM/kg	Provided by H. Schmidt - 02/22/01		
K21 (Slipping Agent)	1.13	\$/lb.	Provided by H. Schmidt - 02/22/01		
K21 (Slipping Agent)	11.48	DM/kg			
Masterbatch white	2.35	\$/lb.			
Masterbatch white	9.00	DM/kg	Provided by H. Schmidt - 02/22/01		
Masterbatch white	1.57	\$/lb.			
Derived Total raw material cost excluding compounding cost					
Bioplast GF 105/30/W20	1.153	\$/lb.			
Ecoflex FBX	0.657	\$/lb.			
PLA	0.389	\$/lb.			
Slipping Agent	0.019	\$/lb.			
Loxamid	0.068	\$/lb.			
Loxol	0.003	\$/lb.			
K21	0.007	\$/lb.			
Masterbatch white	0.045	\$/lb.			
Masterbatch Compounding by Techmer PM					
Ecoflex / 55% CaCO3	1.45	1,000 lbs	Kishan Memo - 11/06/00	95%	Masterbatch compounding costs will remain relatively high without competition
Ecoflex / 64% TiO2/BaSO4	1.85	\$/lb.	Kishan Memo - 11/06/00	95%	
Ecoflex / (Assume) 60% TiO2	1.50	\$/lb.	Kishan Memo - 11/06/00	95%	
Biomax / 61% CaCO3	1.50	\$/lb.	Kishan Memo - 11/06/00	95%	
Biomax / 53% TiO2/BaSO4	1.70	\$/lb.	Kishan Memo - 11/06/00	95%	
Biomax / 50% SiO2	1.62	\$/lb.	Kishan Memo - 11/06/00	95%	
In-line Process					
Combined in-line		\$/lb.	Blow, Slit, (Embosse), Print & Sheet	Converter is not yet identified Dupont will not convert.	
Blowing			Integral to in-line process	This process step not optimized	
Gemini Plastics	0.36	\$/lb.			
Transamerican Plastics	0.32	\$/lb.			
Polymer Packaging	0.32	\$/lb.			

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## Biodegradable Wrap Model

### Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Silting					
Gemini Plastics					
Machine/Labor rate	\$ 36.00	\$/hour	Integral to in-line process	This process step not optimized Rate for higher volumes unknown. Assume same as low volumes	
Machine speed	300.0	ft/min	Represents speed of slowest process in-line		
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00053	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 65.00	\$/hour		Rate for higher volumes unknown. Assume same as low volumes	
Machine speed	300.0	ft/min		Assumes improvement in machine speeds	
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min	Assume part no greater than 15" x 15"		
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00150	\$/part			
Printing					
Associated Polybag					
Machine/Labor rate	\$ 120.00	\$/hour	Integral to in-line process	This process step not optimized	
Machine speed	300.0	ft/min		Rate for higher volumes unknown. Assume same as low volumes	
Machine width	45.0	in		Assumes improvement in machine speeds	
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min	Assume part no greater than 15" x 15"		
Cost per part	\$ 0.00276	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 125.00	\$/hour		Rate for higher volumes unknown. Assume same as low volumes	
Machine speed	300.0	ft/min		Assumes improvement in machine speeds	
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min	Assume part no greater than 15" x 15"		
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00259	\$/part			

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## Biodegradable Wrap Model

### Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Embossing					
Gemini Plastics					
Machine/Labor rate	\$ 45.00	\$/hour			
Machine speed	300.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00167	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	300.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00089	\$/part			
Sheeting					
Associated					
Machine/Labor rate	\$ 35.00	\$/hour			
Machine speed	63.3	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	63.6	parts/min			
Parts per minute on given machine	199.9	parts/min			
Cost per part	\$ 0.00292	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	50.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	40.0	parts/min			

Integral to in-line process

Assume part no greater than 15" x 15"

Assume part no greater than 15" x 15"

Not part of in-line process

Assume part no greater than 15" x 15"

100 ppm per lane; 2 lanes

Assume part no greater than 15" x 15"

This process step not optimized

Rate for higher volumes unknown. Assume same as low volumes

Assumes improvement in machine speeds

Rate for higher volumes unknown. Assume same as low volumes

Assumes improvement in machine speeds

This process step not optimized

Specific Sheeter equipment exists, so that the Bagger would not need to be modified

Rate for higher volumes unknown. Assume same as low volumes

# EarthShell Corporation

## Biodegradable Wrap Model

### Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Parts per minute on given machine	123.0	parts/min	Sheeting's limiting factor is 'catching' the sheeted wraps as they come off of the machine, i.e. manual limitation		
Cost per part	0.00514	\$/part			
<u>High Commercial Volume</u>					Product design still not finalized.
Inorganics					
Anti-block - SiO2	\$ 0.14	\$/lb.	Randy verified price	95%	
Whitener - TiO2	\$ 0.99	\$/lb.	Randy verified price	95%	
Inorganic Filler - CaCO3	\$ 0.69	\$/lb.	Randy verified price	95%	
Resin					
Biomax 4026 - DuPont (Rigid)	\$ 1.00	\$/lb.	\$1.00 provided by Simon based upon perceived economies with volume	10%	
Ecoflex FBX - BASF (Flexible)	\$ 4.60	DM/kg	Provided by H.Schmidt based upon general talks with BASF; up to 30,000MT		
Ecoflex FBX - BASF (Flexible)	\$ 0.95	\$/lb.	Assumes 'delivered price'		
Eastar MW - H	\$ 2.00	\$/lb.	High Grade - Provided by Kishan. Assumes 'delivered price'	90%	
Eastar MW - L	\$ 1.33	\$/lb.	Low Grade - Provided by Kishan. Assumes 'delivered price'	90%	
PLA - Hycail B.V. (Rigid)	\$ 1.30	\$/lb.	Provided by Kishan - verbal quote from Bill Kelly. Hycail U.S. prices not yet available		
Masterbatch Compounding by A. Schulman ES4228	\$ -	\$/lb.	Proprietary - A. Schulman Inc.		Randy
% Filler - Assume CaCO3	70%		% of respective Masterbatch		
Masterbatch Compounding by Biotec					
Bioplast GF 105/30 (Wrap)	\$ 6.00	DM/kg	Biotec Sales price = 4.50DM Raw Mat. + 1.5DM Compounding	50%	
Bioplast GF 105/30 (Wrap)	\$ 1.24	\$/lb.			
PLA - Germany	\$ 6.63	DM/kg	Provided by H.Schmidt - 02/22/01		
PLA - Germany	\$ 1.37	\$/lb.			
Loxamid (Slipping Agent)	\$ 11.80	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxamid (Slipping Agent)	\$ 2.45	\$/lb.			
Loxol (Slipping Agent)	\$ 5.35	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxol (Slipping Agent)	\$ 1.11	\$/lb.			
K21 (Slipping Agent)	\$ 11.48	DM/kg	Provided by H.Schmidt - 02/22/01		
K21 (Slipping Agent)	\$ 2.38	\$/lb.			

# EarthShell Corporation

## Biodegradable Wrap Model

### Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence
Masterbatch white	9.00	DM/kg	Provided by H. Schmidt - 02/22/01	Open items and assignments Can Biotech compound this, or always 3rd party sourced?
Masterbatch white	1.37	\$/lb.		

Bioplast GF 105/30W20	1.126	\$/lb.	Derived Total raw material cost excluding compounding cost
Ecoflex FBX	0.629	\$/lb.	
PLA	0.359	\$/lb.	
Slipping Agent	0.019	\$/lb.	
Loxamid	0.006	\$/lb.	
Loxiol	0.003	\$/lb.	
K21	0.007	\$/lb.	
Masterbatch white	0.089	\$/lb.	

Masterbatch compounding costs will remain relatively high without competition

Masterbatch Compounding by Techmer PM  
 Ecoflex / 55% CaCO3  
 Ecoflex / 64% TiO2/BaSO4  
 Ecoflex / (Assume) 60% TiO2  
 Biomax / 61% CaCO3  
 Biomax / 53% TiO2/BaSO4  
 Biomax / 50% SiO2

	40000 lbs
\$	\$/lb.
\$	\$/lb.
\$	\$/lb.
\$	\$/lb.
\$	\$/lb.
\$	\$/lb.
\$	\$/lb.

Assumes cocktail produced at primary  
 Assumes cocktail produced at primary  
 Assumes cocktail produced at primary  
 Assumes cocktail produced at primary  
 Assumes cocktail produced at primary  
 Assumes cocktail produced at primary

In-line Process

\$	0.30	\$/lb.
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Converter is not yet identified  
 Dupont will not convert.

Blowing  
 Gemini Plastics  
 Transamerican Plastics  
 Polymer Packaging

\$	\$/lb.
\$	\$/lb.
\$	\$/lb.

This process step not optimized

Slitting  
 Gemini Plastics

Integral to in-line process

This process step not optimized  
 Rate for higher volumes unknown. Assume same as low volumes

Machine/Labor rate

In-line Process precludes this cost

Machine speed  
 Machine width  
 Part width  
 Parts wide  
 Parts per minute (single width)  
 Parts per minute on given machine  
 Cost per part

\$	\$/hour
300.0	ft/min
45.0	in
15.0	in
3.0	parts
240.0	parts/min
720.0	parts/min
\$	\$/part

Assumes improvement in machine speeds

Represents speed of slowest process in-line  
 Assume part no greater than 15" x 15"

Transamerican Plastics

General Assumptions  
 9/19/2005 - 6:48 PM

Wrap Model - Rev 005 040501 (2)  
 N:\models\Polarcup EarthShell\Clamshell



# EarthShell Corporation

## Biodegradable Wrap Model

### Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes	Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			
Machine width	45.0	in	Assume part no greater than 15" x 15"	Assumes improvement in machine speeds	Assumes improvement in machine speeds
Part width	15.0	in			
Parts wide	3.0	parts	Integral to in-line process	This process step not optimized	This process step not optimized
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$	\$/part			
Printing					
Associated Polybag					
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes	Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			
Machine width	45.0	in	Assume part no greater than 15" x 15"	Assumes improvement in machine speeds	Assumes improvement in machine speeds
Part width	15.0	in			
Parts wide	3.0	parts	Integral to in-line process	This process step not optimized	This process step not optimized
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes	Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			
Machine width	45.0	in	Assume part no greater than 15" x 15"	Assumes improvement in machine speeds	Assumes improvement in machine speeds
Part width	15.0	in			
Parts wide	3.0	parts	Integral to in-line process	This process step not optimized	This process step not optimized
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$	\$/part			
Embossing					
Gemini Plastics					
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes	Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			
Machine width	45.0	in	Assume part no greater than 15" x 15"	Assumes improvement in machine speeds	Assumes improvement in machine speeds
Part width	15.0	in			
Parts wide	3.0	parts	Integral to in-line process	This process step not optimized	This process step not optimized
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$	\$/part			
Transamerican Plastics					
General Assumptions					

# EarthShell Corporation

## Biodegradable Wrap Model

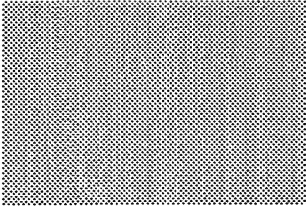
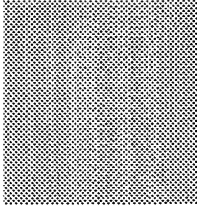
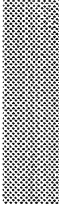
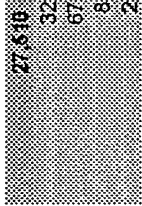
### Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Machine/Labor rate	\$ 300.0	\$/hour	In-line Process precludes this cost		Rate for higher volumes unknown. Assume same as low volumes
Machine speed	45.0	ft/min			
Machine width	15.0	in			
Part width	3.0	parts	Assume part no greater than 15" x 15"		Assumes improvement in machine speeds
Parts wide	240.0	parts/min			
Parts per minute (single width)	720.0	parts/min			
Parts per minute on given machine	-	\$/part			
Cost per part	-				
Sheeting Associated			Not part of in-line process		This process step not optimized
Machine/Labor rate	\$ 53.3	\$/hour			
Machine speed	45.0	ft/min			
Machine width	15.0	in			
Part width	3.0	parts	Assume part no greater than 15" x 15"		
Parts wide	66.6	parts/min			
Parts per minute (single width)	199.9	parts/min			
Parts per minute on given machine	-	\$/part			
Cost per part	-				
Transamerican Plastics					
Machine/Labor rate	\$ 50.0	\$/hour	In-line Process precludes this cost		Rate for higher volumes unknown. Assume same as low volumes
Machine speed	45.0	ft/min			
Machine width	15.0	in			
Part width	3.0	parts	Assume part no greater than 15" x 15"		
Parts wide	40.0	parts/min			
Parts per minute (single width)	-		Sheeting's limiting factor is 'catching' the sheeted wraps as they come off of the machine, i.e. manual limitation		
Parts per minute on given machine	120.0	parts/min			
Cost per part	-	\$/part			
V. Freight costs:					
Between converters (Truck)	\$ 0.05	\$/lb		75%	Generally accepted rate
Germany to Baltimore - 40' Container					
Duty	7.03%	% of Value	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Customs Entry	145.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Ocean Freight	3,650.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Trucking	325.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Messenger	15.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote

EarthShell Corporation

Biodegradable Wrap Model

Assumptions:

	<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
VI. Energy costs:			\$/k pieces			Toll manufacturing
VII. Labor Rates:						
Skill Level:	1					Toll manufacturing
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
Salary Level:	1					
	2					
	3					
	4					
	5					
	6					
	7					
Fringe Benefits						
OT premium - average						
VIII. Direct Labor Staffing						Toll manufacturing
			Heads/line	Requires Skill level:		
VIII. Nameplate capacity						
Products/plate			27	product per hour		
Cycle time (sec)			32 pieces			
# presses/line (module)			67 sec			
# of Lines			8 presses			
			2 lines			
IX. Planned Operating Hours						Toll manufacturing
X. Quality Expectations (material efficiency) at each point for potential loss due to imperfect parts						Toll manufacturing
XI. Uptime Expectations for each unit operation (operating efficiency)						Toll manufacturing

**EarthShell Corporation**  
**Biodegradable Wrap Model**  
**Assumptions:**

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
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# EarthShell Corporation

## Biodegradable Wrap Model

### Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Manufacturing Overhead					
XII. Indirect Staffing		Heads/line	Requires Skill level:		Toll manufacturing
XIII. Other Semi Variable Plant Overhead Percent in lieu of \$ detail	0.0%				Toll manufacturing
XIV. Fixed Plant Overhead Plant management:		Heads/line	Requires Salary level:		Toll manufacturing
SG&A	0%	%			
<u>Capital</u>					
CapEx Contingency	0%				Toll manufacturing
Capital Installation	0%				Toll manufacturing
Capital Life	0 years		Straight line	100%	Toll manufacturing
Assumptions working capital					
-inventory materials 2 weeks				0%	
-inventory finished goods 2 weeks				0%	
-trade receivables 1 month				0%	
-trade payables 1 month				0%	

**EarthShell Corporation**  
**Biodegradable Wrap Model**

**Sandwich Wrap L - PLA/Ecoflex - 50 micron**  
**50% PLA, 15% Ecoflex / 35% Filler - ES4338**  
**15" x 15"**

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
<b>Raw Materials:</b>						
PLA - Hycail B.V.	50.0% (a)	(b)	1.00	0.00	1.00	5.62
Ecoflex FBX	15.0% (a)	0.77 (b)	1.00	1.68	0.95	1.61
Filler - Assume CaCO2	35.0% (a)				0.14	0.55
<b>Total Raw Materials</b>	100.0%			1.68		7.78
<b>Formulation:</b>						
PLA - Hycail B.V.	50.0%	2.55 (b)	1.00	5.62	0.00	0.00
Masterbatch Compounding (cost incl. inorganics): PaperMatch ES4338	50.0%	2.55 (b)	0.75	4.22	0.00	0.00
<b>Total Formulation</b>	100.0%	5.10		9.84		0.00
<b>Subtotal Raw Mat./Formulation</b>				11.52		7.78
Combined film converting process		5.10	0.00	0.00	0.30	3.37
<b>Separate converting processes</b>						
<b>Blowing:</b>						
Gemini		5.10	0.36	4.05	0.00	0.00
<b>Printing:</b>						
Associated				2.78		0.00
<b>Embossing:</b>						
No				0.00		0.00
<b>Sheeting/Slitting:</b>						
Associated				2.92		0.00
<b>Separate converting processes</b>				9.74		0.00
Cost of Manufacture				21.26		11.15
Markup	30%			6.38		3.35
<b>Target Selling Price</b>				27.64		14.50

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.  
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.

**EarthShell Corporation**  
**Biodegradable Wrap Model**

**Sandwich Wrap L - Biomax/Eastar - 50 micron**  
**50% Biomax - 4026, 15% Eastar MW / 35% Filler - ES4338**  
**15" x 15"**

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
<b>Raw Materials:</b>						
Biomax 6926	50.0% (a)	(b)	1.00	0.00	1.00	5.62
Eastar MW - H	15.0% (a)	0.77 (b)	2.00	3.37	2.00	3.37
Filler - Assume CaCO2	35.0% (a)				0.14	0.55
<b>Total Raw Materials</b>	100.0%			3.37		9.55
<b>Formulation:</b>						
Biomax 6926	50.0%	2.55 (b)	1.00	5.62	0.00	0.00
Masterbatch Compounding (cost incl. inorganics): PaperMatch ES4338	50.0%	2.55 (b)	0.75	4.22	0.00	0.00
<b>Total Formulation</b>	100.0%	5.10		9.84		0.00
<b>Subtotal Raw Mat/Formulation</b>				13.21		9.55
Combined film converting process		5.10	0.00	0.00	0.00	3.37
<b>Separate converting processes</b>						
<b>Blowing:</b>						
Genist		5.10	0.36	4.05	0.00	0.00
<b>Printing:</b>						
Associated				2.74	0.00	0.00
<b>Embossing:</b>						
No				0.00	0.00	0.00
<b>Sheeting/Splitting:</b>						
Associated				2.92	0.00	0.00
<b>Separate converting processes</b>				9.74		0.00
Cost of Manufacture				22.95		12.92
Markup	30%			6.89		3.88
<b>Target Selling Price</b>				29.84		16.79

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.  
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.

**EarthShell Corporation**  
**Biodegradable Wrap Model**

**Sandwich Wrap L - Biomax/Ecoflex - 50 micron**  
**50% Biomax - 4026, 15% Ecoflex / 35% Filler - ES4338**  
**15" x 15"**

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
<b>Raw Materials:</b>						
Biomax 6926	50.0% (a)	(b)	1.00	0.00	1.00	5.62
Ecoflex FBX	15.0% (a)	0.77 (b)	1.00	1.68	0.95	1.61
Filler - Assume CaCO2	35.0% (a)				0.14	0.55
<b>Total Raw Materials</b>	100.0%			1.68		7.78
<b>Formulation:</b>						
Biomax 6926	50.0%	2.55 (b)	1.00	5.62	0.00	0.00
Masterbatch Compounding (cost incl. inorganics): PaperMatch ES4338	50.0%	2.55 (b)	0.75	4.22	0.00	0.00
<b>Total Formulation</b>	100.0%	5.10		9.84		0.00
<b>Subtotal Raw Mat/Formulation</b>				11.52		7.78
Combined film converting process		5.10	0.00	0.00	0.30	3.37
<b>Separate converting processes</b>						
<b>Blowing:</b>						
Gemini		5.10	0.36	4.05	0.00	0.00
<b>Printing:</b>						
Associated				2.78		0.00
<b>Embossing:</b>						
No				0.00		0.00
<b>Sheeting/Sitting:</b>						
Associated				2.92		0.00
<b>Separate converting processes</b>				9.74		0.00
Cost of Manufacture				21.26		11.15
Markup	30%			6.38		3.35
<b>Target Selling Price</b>				27.64		14.50

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000, i.e. single compounding step.  
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.



**EarthShell Corporation**  
**Biodegradable Wrap Model**

**Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron**  
**Ecomax 20/80, 3% SiO2, 5% TiO2, 25% CaCO2 filled, white, printed 4 colors, 30 micron**  
**15" x 15"**

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
<b>Raw Materials:</b>						
Biomax 6926	53.6% (a)	0.18 (b)	1.00	0.40	1.00	7.21
Ecoflex FBX	13.4% (a)	1.72 (b)	1.00	3.77	0.95	1.72
Anti-block - SiO2	3.0% (a)				0.14	0.06
Whitener - TiO2	5.0% (a)				0.99	0.67
Inorganic Filler - CaCO3	25.0% (a)				0.03	0.30
<b>Total Raw Materials</b>	<b>100.0%</b>			<b>4.18</b>		<b>9.95</b>
<b>Formulation:</b>						
Biomax 6926	50.2%	1.84 (b)	1.00	4.06	0.00	0.00
Ecoflex FBX	13.4%	0.82 (b)	1.00	1.79	0.00	0.00
Masterbatch Compounding (cost incl. inorganics):						
Biomax / 50% SiO2	6.0%	0.37 (b)	1.62	1.31	0.00	0.00
Biomax / 53% TiO2/BaSO4	9.4%	0.58 (b)	1.70	2.16	0.00	0.00
Biomax / 61% CaCO3	41.0%	2.50 (b)	1.50	8.27	0.00	0.00
<b>Total Formulation</b>	<b>100.0%</b>	<b>5.10</b>		<b>17.58</b>		<b>0.00</b>
<b>Subtotal Raw Mat./Formulation</b>				<b>21.76</b>		<b>9.95</b>
Combined film converting process		6.10	0.00	0.00	0.00	4.03
<b>Separate converting processes</b>						
<b>Blowing:</b>						
Genin		6.10	0.36	4.84	0.00	0.00
<b>Printing:</b>						
Associated				2.78	0.00	0.00
<b>Embossing:</b>						
Ng				0.00	0.00	0.00
<b>Sheeting/Splitting:</b>						
Associated				2.92	0.00	0.00
<b>Separate converting processes</b>				<b>10.54</b>		<b>0.00</b>
Cost of Manufacture				32.30		13.99
Markup	30%			9.69		4.20
<b>Target Selling Price</b>				<b>41.99</b>		<b>18.18</b>

Notes:  
(a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.  
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.